

[54] **WEB DRYER**

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[51] Int. Cl.**B65h 17/32**

[58] Field of Search**34/156; 226/7, 97**

[56]

References Cited

UNITED STATES PATENTS

3,559,301 2/1971 Fraser 34/156

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[57]

ABSTRACT

A plurality of airfoil nozzles are disposed alternately on opposite sides of the moving web, each nozzle having a flat face generally parallel to the web and ending in a substantially 90° corner of the plenum chamber.

3 Claims, 3 Drawing Figures

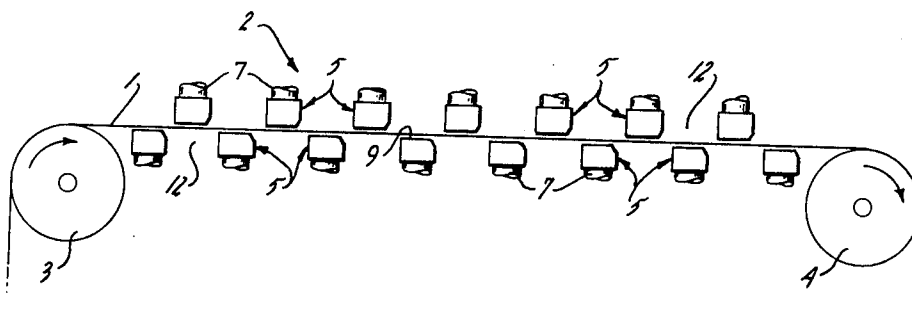


FIG. 1

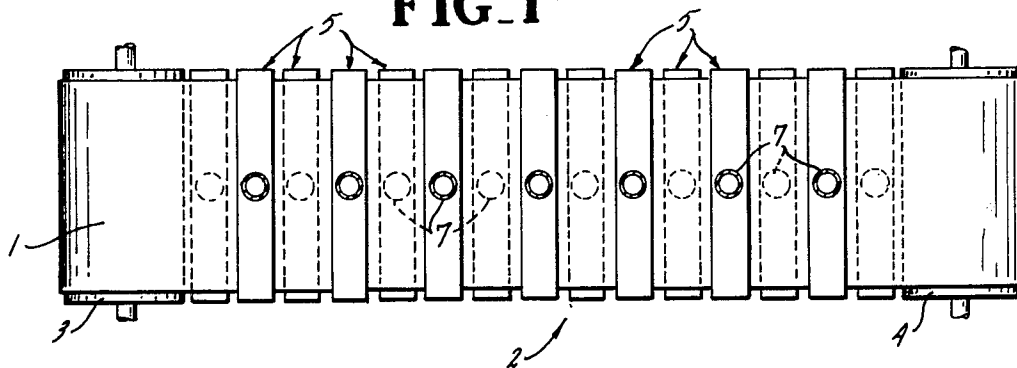


FIG. 2

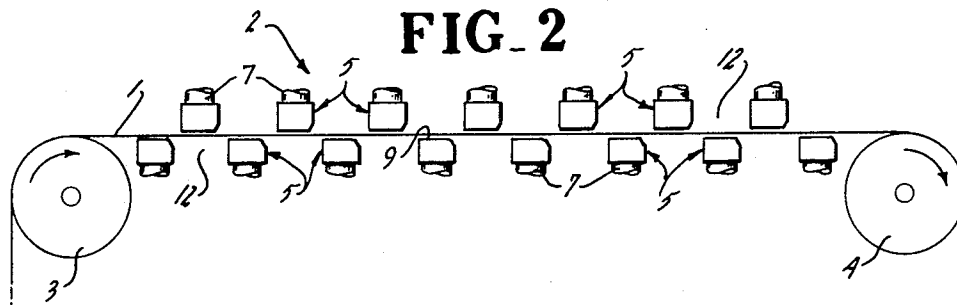
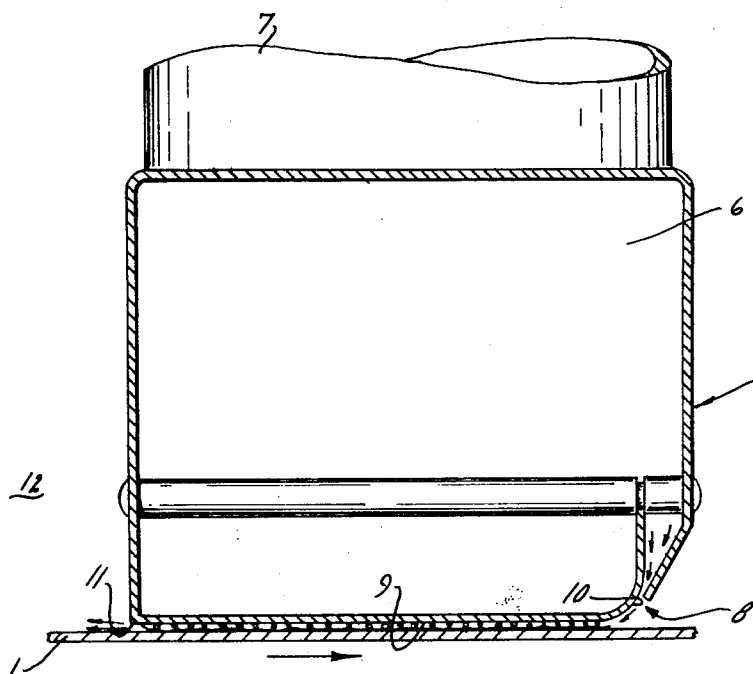


FIG. 3



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WEB DRYER

CROSS REFERENCE TO RELATED APPLICATION

This application is a continuation in part of application Ser. No. 89,744, now U.S. Pat. No. 3,650,043 filed on Nov. 16, 1970 by the present applicants for Airfoil Web Dryer, and copending herewith.

BACKGROUND OF THE INVENTION

This invention relates to web dryers as employed in paper and synthetic web manufacture and as employed in the printing and coating of papers and synthetic webs or films.

In the application of airfoil nozzles on opposite sides of the web in a drying zone wherein the nozzles support or position the web as the same moves therebetween, difficulty has been encountered in keeping the web planular as distinguished from a tortuous or wavy path through the dryer.

It has generally been considered desirable to remove the spent air from the dryer zone and from further contact with the web as rapidly as possible.

However, where the plenum chamber of each airfoil nozzle had a rounded exhaust corner which had a Coanda effect it was found that the air followed the curvature of the corner and left the web abruptly, thereby tending to induce a wave motion in the web which was undesirable.

Disposition of the nozzles in direct opposition with the web therebetween tended to produce a more objectionable flutter in the web as it left the space between the nozzles, and depending upon inequalities in the forces involved still resulted in the undesirable wave characteristics.

Attempts to place the nozzles on each side close together or to have adjacent nozzles provide a discharge flow in opposite directions along the web only served to accentuate the wave formation.

Applicants are unaware of any prior art relevant to the problem involved other than their attempts to solve the problem as above explained.

SUMMARY OF THE INVENTION

In carrying out the present invention the airfoil nozzles on each side of the web are spaced apart a greater distance than the width of a nozzle and are disposed alternately in series with respect to the nozzles on the opposite side of the web so that each nozzle is enabled to control the movement of the web in the zone of the nozzle without interference from nozzles on the opposite side of the web.

Additionally each airfoil nozzle is designed with a sharp trailing corner or edge of the plenum chamber or airfoil surface to thereby effect a release of the web so that it can move into the zone of and be freely controlled by the adjacent airfoil nozzle.

The sharpness of the trailing edge of the airfoil surface of the nozzle should be such as to avoid any appreciable Coanda effect with respect to the air passing out from under the edge.

BRIEF DESCRIPTION OF THE DRAWING

The accompanying drawing illustrates the best mode presently contemplated by the inventors for carrying out the invention.

In the drawing:

FIG. 1 is a top plan view of a web drying operation illustrative of the drying zone;

FIG. 2 is a side elevation of the web dryer of FIG. 1; and

FIG. 3 is an enlarged section of a portion of the dryer with adjacent airfoil nozzles and showing the web passing the same and the flow of air as it effects the web.

DESCRIPTION OF THE PREFERRED EMBODIMENT

With reference to the preferred embodiment illustrated in the drawing, the web 1 is supplied to the dryer zone 2 by the roll 3 and is withdrawn from the dryer zone 2 by the roll 4.

The course of movement of the web 1 through zone 2 from roll 3 to roll 4 is generally planular.

In the zone 2 the web 1 is treated by a plurality of separate air flows induced by a series of airfoil nozzles 5 disposed alternately above and below the web, as illustrated in FIGS. 1 and 2.

The arrangement of the nozzles 5 is generally the same as that of nozzles 4 illustrated in FIGS. 1 and 2 of the copending application referred to above and each nozzle comprises a plenum chamber 6 extending transversely of the web 1 for its full width and supplied with air by a central lead conduit 7 in its back side.

The chamber 6 is generally rectangular in cross section and has an airfoil nozzle 8 at the forward edge of its face 9.

The nozzle 8 comprises a slot extending generally for the length of chamber 6 and having its inner side curved as at 10 to constitute an airfoil surface merging into face 9.

The face 9 of the chamber 6 extends generally parallel to the web 1 and constitutes an extension of the airfoil surface 10 along which the air flows from nozzle slot 8.

As explained in the above identified copending application the air passing through the slot of nozzle 8 at a high velocity follows the curved airfoil surface 10 to the space between face 9 and web 1 where the air becomes turbulent and continues in this manner to the trailing edge 11 of face 9.

If the edge 11 is rounded sufficiently to create a Coanda effect the air will tend to follow the curvature as illustrated in FIG. 3 of the copending application and to draw the web upwardly therewith in a wave pattern which tends to interfere with the desired planular movement of the web and with control of the web by the adjacent airfoil nozzle.

The present invention is based upon the discovery that the undesirable wave pattern of the web can be avoided by making the trailing edge 11 of face 9 reasonably sharp as illustrated herein and thereby substantially eliminating the Coanda effect at this location.

With a sharp trailing edge 11 the air tends to follow the web 1 as it leaves the space between face 9 and the web, as shown in FIG. 3.

The next adjacent plenum chamber 6 having a nozzle 8 is spaced from the trailing edge 11 a distance substantially greater than the width of a plenum chamber 6 to provide adequate space 12 through which the air discharging at high velocity from beneath the edge 11 can be withdrawn from the drying zone 2.

The web is controlled in its travel across space 12 between two adjacent plenum chambers 6 by a plenum chamber 6 and its nozzle 8 on the opposite side of the web as determined by the alternate arrangement of the nozzles previously referred to.

The air being discharged from beneath the trailing edge 11 enters the space 12 and releases the web 1 so that it is then subject to control in position by the airfoil nozzle disposed on the opposite side of the web.

Various modes of carrying out the invention are contemplated as being within the scope of the following claims particularly pointing out and distinctly claiming the subject matter which is regarded as the invention.

We claim:

1. A web dryer employing a plurality of airfoil nozzles disposed alternately in series on opposite sides of the moving web in a drying zone, and in which the airfoil surface of each nozzle extends for a substantial

distance generally parallel to the web and terminates in a sharp edge to release the air in a direction of flow along the web.

2. The web dryer of claim 1 in which the airfoil nozzles on each side of the web are spaced apart a greater distance than the width of a nozzle to ensure avoidance of interference between alternate nozzles with respect to control of web movement.

3. A web dryer employing a plurality of airfoil nozzles disposed alternately in series on opposite sides of the moving web in a drying zone, said nozzles on each side of the web being spaced apart a greater distance than the width of the intermediate nozzle on the opposite side of the web to provide a control of web movement by each nozzle generally free from interference from nozzles on the opposite sides of the web.

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